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Vol. 108. Part 8. Pp. 357–384. 40 text-figs. 26th October, 1956.

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THE TRANSACTIONS OF THE ROYAL ENTOMOLOGICAL SOCIETY OF LONDON

World List abbreviation: *Trans. R. ent. Soc. Lond*

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LONDON:
PUBLISHED BY THE SOCIETY AND
SOLD AT ITS ROOMS, 41, QUEEN'S GATE S.W. 7

Price 10s. 6d.

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THE TAXONOMY OF SOME BRITISH APHELINID PARASITES (HYMENOPTERA) OF SCALE INSECTS (COCCOIDEA).

By S. Mashhood Alam, Ph.D., D.I.C., F.R.E.S.

Manuscript received 25th January, 1956.

(Read 4th April, 1956.)

[With 40 Text-figures]

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I. Introduction.

Ashmead's (1904) suggested division of the family Aphelinidae into two tribes Pteroptricini and Aphelinini, on the basis of the number of tarsomeres, is acceptable to almost all workers on the taxonomy of this family including Mercet. Recently, Compere (1936) declared the division artificial. De Santis (1946) dropped the tribes and divided the family into three subfamilies, Calesinae Aphelininae and Coccophaginae. Since much may be said on both sides, the present writer suggests the use of Ashmead's tribal character supplemented with the condition of the speculum of the forewings as broad group characters; it has proved satisfactory for the British genera included in this paper. Flanders (1953) has compiled a composite key using both behavioral and morphological

characters for eighteen genera of Aphelinidae. This appears to be of great value when morphological characters are not decisive.

Over a century ago Westwood and Walker described Aphelinids from Great Britain. Morley (1910) listed four genera with twenty-four species. More recently, Kloet and Hincks (1945) have given an up-to-date list of ten genera.

The present work is intended as an introduction to the study of the family Aphelinidae inhabiting Coccids in great Britain. It includes the descriptions of twelve species, of which eleven are new, belonging to seven genera. The genera *Azotus* Howard and *Casca* Howard are new to Britain.

II. Family Aphelinidae.

A large number of Aphelinidae were bred from Coccids found in the grounds of the Imperial College Field Station, Silwood Park, Berks. They belong to the following genera, for which a key has been prepared with a view to putting together, as far as possible, the closely allied genera.

Revised key to the females of the genera of Aphelinidae here studied.

1 Tarsi 4-segmented; fore wings without speculum 2
– Tarsi 5-segmented; fore wings with or without speculum 3
2 Antennae 8-segmented, three segments of funicle short and together much shorter than club; marginal vein shorter than submarginal vein; tibial spur of middle legs longer than basitarsus; outer plates of ovipositor uniformly broad with thickened dorsal margin **Pteroptrix** Westwood
– Antennae 7-segmented, funicle 2-segmented; tibial spur of middle legs as long as basitarsus and second tarsal segment united; basitarsus of middle legs very short; outer plates of ovipositor not uniformly broad and possessing a broad marginal inflection along dorsal margin . . . . . **Casca** Howard
3 Antennae more than 6-segmented; fore wings devoid of speculum . 4
– Antennae 6-segmented, club entire; eyes sparingly pubescent; fore wings always with speculum, marginal vein much longer than submarginal vein; outer plates of ovipositor with oblique ridge; ovipositor long and generally concealed . . . . . **Aphytis** Howard
4 Funicle 3-segmented with segments subequal in length; club clearly 3-segmented; outer plates of ovipositor very broad in distal half; first valvifers triangular 5
– Funicle 4-segmented with third segment much shorter than the rest; club entire or 2-segmented; pronotum with anterior and posterior margins deeply concave and a submarginal ridge along each lateral margin; stigmal vein with swollen apex; entire outer plates of ovipositor narrow; first valvifers semicircular . . . . **Azotus** Howard
5 Posterior margin of pronotum deeply concave in middle; mesoscutum with reduced number of bilaterally arranged setae; apex of outer plates of ovipositor narrowly rounded 6
– Anterior margin of pronotum deeply concave in middle, posterior margin straight preceded by a submarginal ridge; mesoscutum usually profusely setose; marginal vein clearly longer than half the length of submarginal vein; outer plates of ovipositor with broadly rounded apex and with very broad marginal inflection along dorsal margin **Coccophagus** Westwood

6 Pronotum formed of two separate sclerotic pieces; fore wings distinctly narrow; length of hairs of marginal fringe usually greater than maximum width of fore wing; hind wings clearly pedunculate **Aspidiotiphagus** Howard

– Pronotum formed of one continuous sclerotic plate with a submarginal ridge along posterior margin; fore wings normal; length of hairs of marginal fringe clearly shorter than half the width of fore wing; hind wings generally non-pedunculate . . . **Prospaltella** Howard

1. *Aspidiotiphagus* Howard.

This genus is sometimes confused with *Prospaltella* Howard. One new character, namely the pronotum formed of two separate sclerotic pieces (fig. 2) and not one continuous plate with a submarginal ridge along the posterior margin as in *Prospaltella*, makes the two genera distinct.

The relationship between the length of the hairs of the marginal fringe and the width of the fore wing makes it possible to split the genus *Aspidiotiphagus* into two groups. In one group the hairs of the marginal fringe are a little shorter, while in the other they are longer than the maximum width of the fore wing. The former group, namely **Paraspidiotiphagus** subgen. n., includes *A. flavus* Compere and *A. latipennis* Compere. The other group, **Aspidiotiphagus** Howard subgen. n., contains *A. citrinus* (Craw), *A. lounsburyi* (Berlese and Paoli), *A. silwoodensis* sp. n. and *A. cyanophylli* sp. n. The species *A. australiensis* Girault and *A. fuscus* Compere are not included in the discussion because their descriptions do not mention this point. The length of the hairs of the marginal fringe being an important taxonomic character justifies treating these two groups as subgenera of *Aspidiotiphagus* Howard, one of them showing a possible link with the genus *Prospaltella* Howard.

Key to Subgenera based on Females.

1 Hairs of marginal fringe of fore wing clearly longer than maximum width of disc . . . . . **Aspidiotiphagus** Howard subgen. n. type *A. citrinus* (Craw)

– Hairs of marginal fringe of fore wings not longer than maximum width of disc . . . . . **Paraspidiotiphagus** subgen. n., type *A. flavus* Compere

Having erected these two subgenera it seems feasible to prepare keys for the identification of their respective species.

Key to the Females of the Species of the Subgenus *Aspidiotiphagus*.

1 Fore wings not unusually narrow; submarginal vein with two short setae 2

– Fore wings especially narrow with a slight inflection of posterior margin; submarginal vein with one short seta. The three funicle segments usually subequal in length; club segments comparatively long, the three together as long as united lengths of funicle, pedicel and one-half of scape . . . . . **lounsburyi** (Berlese & Paoli)

2 Pedicel longer than 1·5 times the length of second funicle segment and less that 1·5 times that of the third segment; third funicle segment the longest; axillae dark brown; distal end of abdomen yellowish 3

– Pedicel less that 1·5 times length of second funicle segment and more than 1·5 times the length of third segment ; third funicle segment the shortest ; axillae yellowish-brown ; dorsum of abdomen brown **citrinus** (Craw)

3 Scape brownish-yellow ; pedicel about twice as long as first funicle segment ; first funicle segment the shortest ; posterior pronotal margin with three pairs of long setae ; five setae along outer edge of marginal vein ; postmarginal vein very short ; scutum yellowish ; parapsides devoid of setae ; apex of mesopostphragma narrowly rounded . . . . . **silwoodensis** sp. n.

– Basal third of scape whitish ; pedicel 1·5 times longer than first funicle segment ; second funicle segment the shortest ; posterior pronotal margin with two pairs of long setae ; six long setae along outer edge of marginal vein ; postmarginal vein absent ; almost entire scutum dark brown ; each parapsidal lobe with one long seta ; apex of mesopostphragma broadly rounded . . . . . **cyanophylli** sp. n.

Key to the Females of the Species of the Subgenus *Paraspidiotiphagus*.

1 Head, thorax and abdomen entirely yellow or with faint dusky suffusions appearing on the parts which are brown or blackish in the other forms . . . . . **flavus** Compere

– Predominantly dark brown or blackish, with the following parts yellow : mesoscutum, parapsides, scutellum, apex of abdomen and parts behind cercal plates ; antennae, metanotum, dorsum of propodeum and legs mostly whitish . . . . . **latipennis** Compere

Certain new specific characters, namely the number of setae along the posterior margin of the pronotum, on the anterior face of the coxae and along the distal rim of the hind tibiae, are suggested. Nothing can be said about the stability of these characters until they have been studied in all the known species of *Aspidiotiphagus*. However, in *A. silwoodensis* the setae are as follows : (1) three pairs of long setae along posterior margin of pronotum, (2) two very long setae on anterior face of middle and hind coxae, (3) distal rim of hind tibiae devoid of setae. *A. cyanophylli* differs in these characters (p. 362).

Aspidiotiphagus silwoodensis sp. n.

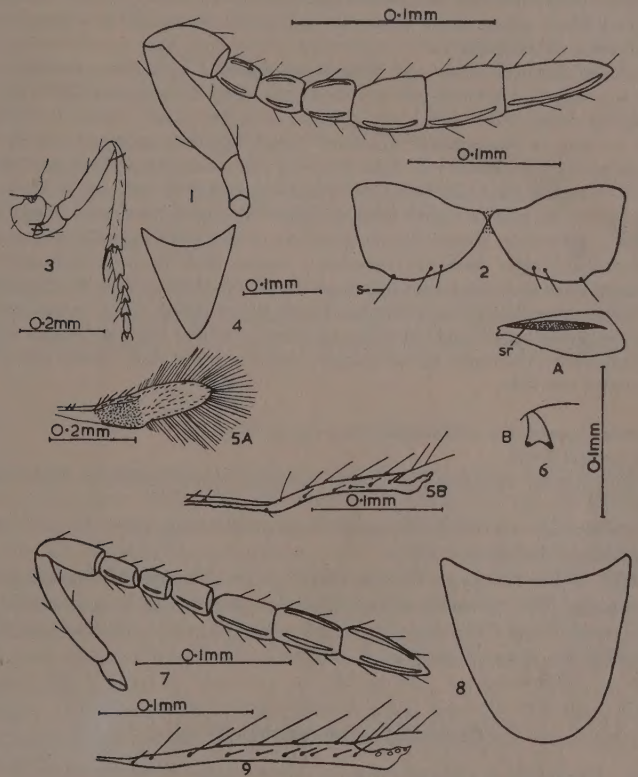
Female.

Head.—Frontovertex yellowish with a pair of narrow dark brown bands extending transversely from basal ocelli to inner rim of eyes ; occiput yellowish with area round foramen magnum very dark brown ; hypostomal, clypeal areas and malar space very dark brown ; frontovertex and upper part of occiput feebly reticulate ; facial area and postgenae shagreened ; frontovertex very broad, about twice length of malar space ; eyes about 1·5 times as long as malar space ; mandibles with three small teeth, inner and central teeth rounded, lateral comparatively pointed, two mandibular glands opening on interdental grooves ; maxillary and labial palps slender and each 1-segmented.

Antennae (fig. 1).—Brownish-yellow ; scape much longer than funicle or pedicel but slightly shorter than their combined lengths ; pedicel about twice as long as first funicle segment, slightly over 1·5 times longer than second, less than 1·5 times longer than third, but shorter than combined lengths of first two funicle segments ; funicle segments clearly longer than broad, first segment the shortest, third the longest ; club tapering towards

apex, a little longer than combined lengths of scape and pedicel ; first funicle to third club segments with 2, 2, 2, 1, 1, 1, sensoria respectively.

Thorax.—As wide as head ; flat ; axillae, tegulae dark brown ; lateral margins of axillae very dark brown ; scutum including parapsides, scutellum, metanotum and median part of propodeum yellowish ; lateral area of propodeum brown ; pro, meso- and metapleura and prosternum dark brown ; meso- and metasterna yellowish-white ; pronotum distinctly reticulate, and consisting of two separate triangular sclerotic pieces linked by a



FIGS. 1–9.—*Aspidiotiphagus* Howard. (1–6) *A. silwoodensis* sp. n. (1) Antenna. (2) Pronotum. (3) Middle leg. (4) Mesopostphragma. (5) Fore wing. (6) Outer plate and first valvifer of ovipositor. (7–9) *A. cyanophylli* sp. n. (7) Antenna. (8) Mesopostphragma. (9) Veins. (*s*, seta ; *sr*, submarginal ridge).

membranous connection, narrow in the middle and possessing three pairs of long setae along posterior margin (fig. 2 *s*) ; scutum including parapsides, axillae, scutellum, metanotum and propodeum shagreened ; pro-, meso- and metapleura reticulate ; scutum with a seta near each angle ; parapsides without setae ; anterior half of each axilla with one seta ; a pair of setae on lateral areas of scutellum close to scutoscutellar groove, slightly mesal to these is a pair of hyaline spots, another pair of long setae near posterior margin of scutellum ; mesopostphragma brown and V-shaped (fig. 4) with narrowly rounded apex ; metanotum narrow ; propodeum narrow in middle, expanded laterally.

Fore wings (figs. 5A and B).—Hyaline with a large brown patch extending from marginal vein to the part of posterior margin opposite to it; basal area under submarginal vein devoid of setae, disc sparingly setose with a distinct hairless oval area close to stigmal vein; submarginal vein with two short brown setae on basal half; marginal vein with an outer row of five moderately long brown setae and an inner row of six short setae; postmarginal vein very short; stigmal vein short and thick; marginal fringe clearly longer than maximum width of the disc.

Hind wings.—Hyaline with basal area lightly fuscous; apex narrowly rounded; very long marginal fringe along entire posterior and apical margins; two long and curved hooklets at apex of marginal vein.

Legs.—Coxae, femora, tibiae and fifth tarsal segment brownish; trochanters, spurs and tarsal segments 1–4 whitish-yellow; mesocoxae (fig. 3) with two very long setae on anterior face of distal half; distal rim of tibiae with two short and stout setae; mesotibial spur as long as basitarsus; remaining tarsal segments subequal and individually shorter than basitarsus; metacoxae with two very long setae on anterior face of distal half.

Abdomen.—Dorsum flat, dark brown but proximal part of second tergum, entire seventh tergum and proximal area of eighth tergum yellowish-brown, distal area of eighth tergum bright yellow; reticulate, almost devoid of setae; 1·25 times longer than thorax but also slightly narrower; apex narrowly rounded; venter dark brown; ovipositor slightly exserted, starting at sixth segment; outer plates of ovipositor narrow in proximal region, gradually broadening distally with distal end narrowly rounded, dorsal margin followed by a long narrow submarginal ridge (fig. 6A *sr*); first valvifers (fig. 6B) clearly triangular; second valvifers with thickened dorsal margin; third valvulae dark brown and immovably joined to second valvifers.

Measurements of female (in millimetres).
Length 0·5, pedicel 0·036.
Length (*width*) funicle segments: first 0·019 (0·015), second 0·0236 (0·0168), third 0·025 (0·02).
Length, postmarginal vein 0·0124, marginal fringe of fore wing 0·13.
Maximum width of fore wing 0·082.

Material.—One holotype female reared 31.v.53, and 17 female paratypes, different dates. Endoparasite of *Lepidosaphes ulmi* (Linn.) on dogwood (*Cornus* sp.) at Silwood Park. The holotype and a few paratypes have been deposited in the British Museum (Nat. Hist.).

Aspidiotiphagus cyanophylli sp. n.

Female.—Resembles *A. silwoodensis* sp. n., except in the following points:

Head.—Vertex yellowish-orange; occiput, ventral clypeal margin very dark brown; facial area yellowish-orange with three triangular brown patches—one on interscrobal area, the other two between antennal sockets and respective eyes; frontovertex very broad, about three times the length of malar area; ocular rim orange-yellow.

Antennae (fig. 7).—Greyish-brown except proximal third of scape which is brownish; pedical 1·5 times longer than first funicle segment and about 1·75 times longer than the second, but shorter than combined lengths of both; second funicle segment the shortest; first funicle to third club segments with 1, 1, 1, 1, 2, 2, sensoria respectively.

Thorax.—Tegulae, axillae and scutum very dark brown with latero-posterior area of scutum and entire parapsides yellowish-orange; pro-, meso- and metasterna brown; preprectus brown with its suture yellowish; pronotum with two pairs of long setae along posterior margin; one seta on outer projection of each parapsidal lobe; mesopostphragma (fig. 8) V-shaped with broadly rounded apex; propodeum brown with a pair of short setae near each spiracle; fore wings (fig. 9) with denser setae on the dark brown patch; only

one seta in basal area ; marginal vein with outer row of six long setae and inner row of eight setae ; postmarginal vein absent.

Legs.—Coxae, femora except trochantellus, tibiae and tarsi of fore and middle legs greyish-brown ; trochanters and trochantellus dirty-white ; metacoxae, femora, except trochantellus and apical tip, dark brown ; tibiae and tarsi greyish-brown ; trochanters, trochantellus and apical tip of femora dirty-white ; three very long setae in a row on anterior face of distal half of middle coxae, two long setae on undersurface of distal rim of femora ; one very long seta on anterior face of distal half of hind coxae, two short stout setae on distal rim of tibiae.

Abdomen.—Dorsum very dark brown with seventh and eighth terga yellowish ; length about 1·5 times greater than that of the thorax ; apex broadly rounded ; base of ovipositor lying in fifth segment.

Measurements of female (in millimetres).
Length 0·673, pedicel 0·043.
Length, funicle segments : first 0·029, second 0·0256, third 0·0318.
Length, marginal fringe of fore wing 0·137.
Maximum width of fore wing 0·091.

Material.—Holotype female and one female paratype reared 13.xi.53. Endoparasite of *Aspidiotus cyanophylli* Sign. on *Cereus peruvianus* at Kew Gardens. The holotype has been deposited in the British Museum (Nat. Hist.).

2. *Coccophagus* Westwood.

This is one of the best defined genera of the family Aphelinidae. Mercet (1929-30), Compere (1931) and De Santis (1946) have given good and reliable characters for its separation from the closely allied genera. Two new characters may be added, namely (1) pronotum with anterior margin deeply concave in middle and the hind margin straight with a submarginal ridge (fig. 10 *psr.*), and (2) distal end of outer plates of ovipositor broadly rounded, their dorsal margins forming a very broad marginal inflection (fig. 12B *mi*). These characters are very clear and can be relied on should some structures become damaged.

C. corni sp. n. and *C. taxi* sp. n. fall in the Lecanii group of the genus *Coccophagus*. Compere (1931) has given a good key for the identification of the members of this group. The following key is modified to include both the new species.

Revised Key of the Females of the Lecanii Group.

1 Hind tibiae usually entirely yellow, sometimes faintly dusky at the base ; all trochanters yellow 2
– Hind tibiae usually blackish or yellowish in parts ; all trochanters yellow or brown 3
2 Fore wings usually faintly and uniformly smoky ; densely and closely ciliated with a small rounded hairless spot near the base ; fore femora dark brown with apex narrowly yellow ; entire fore tibiae yellow **cowperi** Girault
– Fore wings usually hyaline ; trochantellus and apical third of fore femora yellow, rest dark brown ; fore tibiae yellow with a dark brown spot at basal end . . . . . **corni** sp. n.

3 Face and malar space usually blackish or brown; fore and middle femora usually blackish in parts 4
– Face, malar space and antennae yellowish; frontovertex orange, occasionally more or less suffused with fuscous; fore and middle femora rather vaguely and distinctly dusky . . . . **isipingoensis** Compere
4 Frontovertex usually brown or fuscous; scape usually fuscous; flagellum yellow; hind femora blackish with ends yellowish; middle tibiae entirely yellow . . . . . 1 **lecanii** (Fitch)
2 **fuscipes** Howard
– Frontovertex distinctly black; scape dark brown; flagellum brownish-yellow; hind femora dark brown with trochantellus dirty-yellow; fore tibiae dark brown with apical third dirty yellow; middle tibiae yellow with brownish shade on basal two-thirds . . . . . **taxi** sp n.

The separation of *C. corni* sp. n. from *C. cowperi* Girault has been confirmed by comparing the males of the two species :—

C. corni sp. n. ♂.	*C. cowperi* Girault ♂.
(1) Hind femora dark brown with trochantellus and apex yellow.	Hind femora mostly black, yellow at apex.
(2) Hind tibiae dark brown with apex brownish-yellow.	Hind tibiae yellow.

Coccophagus corni sp. n.

Female.

Head.—Black; eyes dirty white, profusely pubescent, ocular rim yellowish; ocelli reddish-brown, sides of ocellar triangle yellowish with the base extending to meet the respective eye rim; from the middle of the base a short yellowish line extends a little distance over the occiput, a similar line continues from the vertex of ocellar triangle to a short distance over the face, basal ocelli well removed from eye rims; base of the triangle about three times longer than side; scrobe devoid of setae; frontovertex wide, about 1·5 times greater than longitudinal diameter of eye; malar space short, a little over one-half longitudinal diameter of eye; mandibles small, apical region quite broad with two feeble rounded teeth, two mandibular glands opening on the teeth; under surface of maxillo-labial complex blackish, maxillary palps 2-segmented; labial palp 1-segmented.

Antennae.—Scape and pedicel dark brown; funicle and club brownish-yellow; scape longer than combined lengths of pedicel and first funicle segment; pedicel shorter than first funicle segment; first funicle segment longest; third the shortest; first funicle to third club segments with 2, 2, 2, 3, 3, 2, sensoria respectively.

Thorax.—Pronotum, scutum, axillae, parapsides, anterior third of scutellum, lateral parts of metanotum, propodeum and venter of the thorax black; posterior two-thirds of scutellum and middle part of metanotum yellow; pronotum with 10 pairs of long setae along posterior submarginal ridge (fig. 10 *s*); three very long setae along each parapsidal suture; three moderately long setae in apical half of each parapside; axillae with two very long setae in each near transcutal suture; scutum and scutellum subequal in length.

Fore wings.—Long; broad; hyaline; postmarginal vein short; stigmal vein sessile, longer than postmarginal vein.

Hind wings.—Hyaline; moderately long marginal fringe along entire posterior and apical margins; apex of marginal vein with five short hooklets.

Fore legs (fig. 11 A).—Reticulate; coxae and about basal two-thirds of femora very dark brown with yellowish coxal apex; trochanters, trochantellus, apical third of femora, entire tibiae and tarsal segments 1–4 yellow with a dark brown spot on outer face of basal

tip of tibiae ; fifth tarsal segment brown ; three very long setae on anterior face of distal half of coxae ; one short and stout seta on anterior face of tibiae near the base of spur.

Middle legs (fig. 11 c).—Reticulate ; coxae except apex, and basal two-thirds of femora very dark brown ; apex of coxae, trochanters, trochantellus and apical third of femora, tibiae, tibial spurs and tarsal segments 1–4 yellow ; fifth tarsal segment brown ; six very long setae on anterior face of coxae ; tibial spur shorter than basitarsus ; tarsus longer than fore tarsus but shorter than hind one.

Hind legs (fig. 11 b).—Reticulate ; coxae very dark brown with apex yellow ; trochanters, trochantellus and femoral apex yellow ; remaining femora very dark brown ; tibiae yellow with a small dark brown patch near base ; tarsal segments 1–4 yellow, fifth brown ; three very long setae on anterior face of distal half of coxae ; four long setae on undersurface of distal end of femora ; nine short, stout setae on distal rim of tibiae.

Abdomen.—Black ; dorsum reticulate ; distal end broadly rounded ; ovipositor dark brown and concealed ; first valvifers clearly triangular with convex base (fig. 12 a, *b*), third valvulae immovably joined with second valvifers, short, with apex rounded.

Male : Resembles the female except in the following characters :

Frontovertex lacks the yellowish triangle and its extensions ; ocular rims not yellow ; flagellum brown ; scutellum and metanotum black ; fore and middle coxae and trochanters brown ; middle tibiae brown with base and apex narrowly yellow ; distal end of hind tibiae brownish-yellow ; body coloration on the whole lighter ; size three-quarters that of female.

Measurements of female (in millimetres).

Length 1·324, scape 0·165, pedicel 0·06.

Length funicle segments : first 0·073, second 0·063, third 0·047.

Length club 0·148.

Material.—Holotype female reared 15.v.53 and 16 female paratypes on different dates. 1 male allotype and 2 male paratypes also bred. Endoparasite of *Eulecanium corni* (Bouché) on blackberry (*Rubus fruticosus*) and black current (*Ribes nigrum*) at Silwood Park. The holotype and a few paratypes have been deposited in the British Museum (Nat. Hist.).

Coccophagus taxi sp. n.

Female.—Differs from *C. corni* sp. n. as follows :

Head.—Frontovertex a little wider than the longitudinal diameter of eye ; malar space about two-thirds the longitudinal diameter of eye ; eyes reddish-brown ; pedicel brownish-yellow ; first funicle to third club segments with 2, 2, 2, 2, 3, 1, sensoria respectively.

Thorax.—Central and a small lateral part of metanotum yellow ; pronotum with 11 pairs of long setae along posterior submarginal ridge.

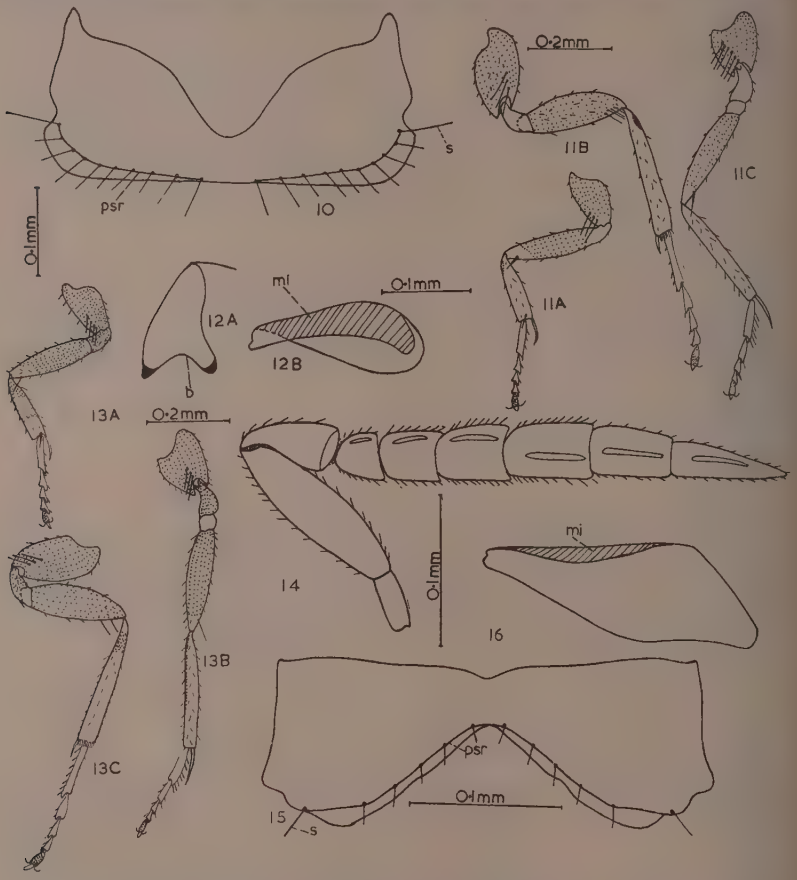
Fore legs (fig. 13 a).—Coxae dark brown ; trochanters and fifth segment brown ; femora dark brown except trochantellus and apical quarter which are dirty-yellow ; apical third of tibiae and tarsal segments 1–4 dirty-yellow, remaining tibiae dark brown ; four very long setae on anterior face of distal half of coxae.

Middle legs (fig. 13 b).—Coxae dark brown ; trochanters and fifth tarsal segment brown ; femora dark brown with trochantellus and apex yellow ; tibiae yellow with brownish shade on outer surface of basal two-thirds ; three very long setae on anterior face of distal half of coxae ; basitarsus longer than tibial spur.

Hind legs (fig. 13 c).—Coxae dark brown ; trochanters brown ; femora dark brown with trochantellus yellow ; two long setae on undersurface of distal end of femora ; 11 short setae along distal rim of tibiae.

Male : Resembles the female except in the following characters :

Scape and pedicel brown ; scutellum and metanotum devoid of yellow colour ; fore tibiae yellow with a broad brown patch on entire basal half except the tip ; middle and hind coxae and tibiae brown with apical quarter of middle tibiae yellow, apical quarter of hind tibiae dirty-yellow ; entire insect brown ; size about three-quarters that of the female.



Figs. 10–16.—*Coccophagus* Westwood and *Prospaltella* Howard. (10–12) *C. corni* sp. n. (10) Pronotum. (11) Fore, middle and hind legs. (12) First valvifer and outer plate of ovipositor. (13) *C. taxi* sp. n. Fore, middle and hind legs. (14–16) *P. silwoodensis* sp. n. (14) Antenna. (15) Pronotum. (16) Outer plate of ovipositor. (*b*, base of first valvifer ; *mi*, marginal inflection of outer plate ; *psr*, submarginal ridge of pronotum ; *s*, seta).

Material.—Holotype female reared 24.v.53, and 50 female paratypes, 1 male allotype and 4 male paratypes on different dates. Endoparasite of *Eulecanium taxi* Habib on *Taxus baccata* L. at Silwood Park. The holotype and a few paratypes have been deposited in the British Museum (Nat. Hist.).

The status of *C. taxi* has already been discussed and the species tentatively placed close to *C. lecanii* (Fitch), which is represented in the British Museum. The males of these species differ as follows :—

C. taxi sp. n. ♂.	*C. lecanii* (Fitch) ♂.
(1) All coxae brown.	All coxae black.
(2) Fore femora brown with trochantellus and apical quarter yellow; middle femora brown with trochantellus and apical quarter yellow; hind femora entirely brown with trochantellus dirty yellow.	All femora mostly black, the ends tipped with yellow.
(3) Fore tibiae yellow with a broad brown patch on entire basal half; middle tibiae brown with apical quarter yellow; hind tibiae brown with apical quarter dirty yellow.	Fore and middle tibiae yellow; hind tibiae more or less extensively suffused with blackish at base.

C. taxi and *C. corni* differ in the female in the following characters. These may be taken as new specific characters for these species.

C. taxi sp. n. ♀.	*C. corni* sp. n. ♀.
(1) Eleven pairs of long setae along posterior margin of pronotum.	Ten pairs of long setae along posterior margin of pronotum.
(2) Four very long setae on anterior face of distal half of fore coxae.	Three very long setae on anterior face of distal half of fore coxae.
(3) Three very long setae on anterior face of distal half of middle coxae.	Six very long setae on anterior face of distal half of middle coxae.
(4) Eleven short and stout setae on distal rim of hind tibiae.	Nine short and stout setae on distal rim of hind tibiae.

3. *Prospaltella* Howard.

Howard (1895, 1907) erected the genus *Prospaltella* for species with a 3-segmented antennal club, the marginal vein much shorter than the submarginal vein, and with a stigmal vein present. Mercet (1929–30) retained the genus but employed other generic characters, namely hairs of marginal fringe shorter than half the width of forewing; forewings generally normal. In addition, a pronotum formed of one continuous piece with a submarginal ridge along the posterior margin (fig. 15) appears to be a good new character to separate the genus from *Aspidiotiphagus* Howard.

Prospaltella silwoodensis sp. n.

Female.

Head.—Reticulate, but interscrobal area only faintly so; vertex, face and ocular rim yellowish; interscrobal area brown; a small, narrow, brown longitudinal band between antennal socket and the corresponding eye rim; occiput dark brown with upper part divided into two patches due to extension of a narrow yellowish line from vertex to foramen magnum; hypostomal area, malar space and lower clypeal margin dark brown; frontovertex profusely setose; occiput and malar space sparingly setose; interscrobal area almost bare; frontovertex wide, slightly narrower than twice the diameter of eye; eyes pubescent; mandibles with outer sharp tooth followed by a broad truncation, two mandi-

bular glands present; maxillary palps cylindrical, 2-segmented, apical segment much longer than the basal one; labial palps 1-segmented.

Antennae (fig. 14).—Dark brown; short; scape clearly longer than pedicel or funicle but shorter than their combined lengths; pedicel more than twice as long as wide, shorter than first and second funicle segments united; first funicle segment the shortest, third the longest and widest; club as long as scape, apex tapering and narrowly pointed, one sensorium on each segment of funicle and club.

Thorax.—Pronotum, tegulae, axillae, posteromesal part of parapsides, scutum except its lateral and posterior marginal areas, dark brown; sides and posterior margin of scutum, parapsides, except posteromesal part, yellowish with a small brown patch near tegulae; scutellum, metanotum and propodeum dark brown with a narrow mid-longitudinal yellowish line on scutellum; parapsidal sutures, scuto-scutellar suture and scutellar part of transcutal fissure yellowish; venter and sides of thorax brown; pronotum with six pairs of long setae (fig. 15; *s*) along posterior submarginal ridge (*psr*); entire thorax reticulate except metanotum and propodeum, which are striated and smooth respectively; scutum longer than scutellum with six pairs of long setae near mid-longitudinal line and three pairs in anterolateral areas; a pair of setae on apical quarter of each parapsidal lobe; axillae with one seta on posterior third; three short setae lateral to each propodeal spiracle; mesopostphragma with narrowly rounded apex extending to third abdominal segment.

Fore wings.—Extending to apex of abdomen; light smoky with a dark brown broad patch at the base near apical end of submarginal vein, another small patch under stigmal vein; stigmal vein swollen, longer than postmarginal vein and forming an acute angle with it; five long setae on submarginal vein; nine long setae along outer edge of marginal vein, another row of ten short setae mesal to it.

Hind wings.—Hyaline; setose; apex narrowly rounded; entire posterior and apical margins with long marginal fringe; four hooklets at apex of marginal vein.

Legs.—Reticulate; coxae, trochanters, femora and tibiae, except trochantellus and apical third of tibiae, basitarsus and fifth tarsal segment dark brown; trochantellus, apical third of tibiae, tibial spur and tarsal segments 2–4 yellowish; fore and hind femora wider than middle femora; fore and middle coxae with six long and stout setae on anterior face; hind coxae with only four such setae; two short, stout setae close to base of middle tibial spur; basitarsus of middle legs a little shorter than tibial spur; seven short, stout setae on distal rim of hind tibiae.

Abdomen.—Dark brown; faintly reticulate; ovipositor hardly exserted with base lying in fourth segment; outer plates of ovipositor (fig. 16) narrow in proximal part, gradually broadening over distal part with distal end narrowly rounded, dorsal margin with a narrow marginal inflection (*mi*); first valvifers triangular; third valvulae short, conical and immovably joined with second valvifers.

Male: Resembles the female except in the following characters:

Antennae yellowish-brown, first funicle to third club segments with 2, 2, 2, 2, 2, 1 sensoria respectively; scutum, parapsides and scutellum dark brown; parapsidal and scutoscutellar sutures and trans-scutal fissure dark brown; entire hind tibiae dark brown; size smaller.

Measurements of female (*in millimetres*).
Length: 1·13, marginal fringe of fore wing 0·045.
Maximum width of fore wing 0·33.
Length (*width*) pedicel 0·061 (0·0344).
Length (*width*) funicle segments: first 0·039 (0·0344), second 0·043 (0·033), third 0·05 (0·036).
Length (*width*) club 0·108 (0·038).

Material.—Holotype female reared 21.vi.53. Five female paratypes and 7 male allotypes and paratypes bred on different dates. Endoparasite of

Quadraspidiotus zonatus (Frauenfeld) on *Quercus robur* L. at Silwood Park. The holotype has been deposited in the British Museum (Nat. Hist.).

P. silwoodensis comes very close to *Prospaltella lahorensis* Howard, which is not represented in the British Museum, but differs in the following characters :—

	P. silwoodensis sp. n.	*P. lahorensis* Howard.
(1)	Antennae dark brown.	Antennae light yellow.
(2)	Pedicel more than twice as long as wide.	Pedicel almost as long as wide.
(3)	First funicle segment shorter than second.	First funicle segment a little longer than the second.
(4)	Third funicle segment clearly longer than second.	Second and third funicle segments almost the same length.
(5)	Club longer than united lengths of second and third funicle segments.	Club as long as the united lengths of second and third funicle segments.
(6)	Fore wings dusky.	Fore wings hyaline.
(7)	Colour of body dark brown.	Colour of body light yellow.
(8)	Size larger.	Size smaller.
(9)	Coccid as host.	*Aleurodes citri* as host.

4. *Aphytis* Howard.

This genus is one of the best-defined in the family Aphelinidae. The presence of a distinct oblique ridge (fig. 21 ; *or.*) on the basal three quarters of the outer plates of the ovipositor may be taken as a new generic character ; it is present in all the three species reared by the present author.

De Santis (1946) has recognised *Aphytis* Howard and *Prosaphelinus* De Gregoria as two subgenera on the basis of the relative lengths of the first two funicle segments and the condition of the ovipositor. The present writer considers it more reasonable to regard these as group characters and drop the proposal to split the genus into two subgenera.

Aphytis zonatus sp. n. takes its place as a new species close to *A. diaspidis* Howard (which is represented in the British Museum) in Mercet's (1929–30) key to species of the genus. The three species bred by the present writer include *A. diaspidis* and the following key is proposed for their identification.

Key to Females of the Species of *Aphytis*.

1 Antennae smoky with dark brown apex ; fore wings with 9–11 oblique rows of short setae between speculum and the base 2

– Antennae yellow ; fore wings with six oblique rows of short setae between speculum and the base ; four transverse rows of long dark brown setae on scutum ; four long setae on anterior face of middle coxae ; four short, stout setae on distal rim of hind tibiae ; body whitish-yellow . . . . . **A. variolosum** sp. n.

2 First funicle segment narrower than second ; third not clearly longer than the combined lengths of first and second ; a pair of longitudinal smoky bands on thoracic dorsum ; six pairs of long setae on posterior margin of pronotum ; fore wings with 11 oblique rows of short setae between speculum and the base ; four transverse rows of long dark brown setae on scutum ; three long setae on anterior face of middle coxae ; eight short, stout setae on distal rim of hind tibiae ; abdominal dorsum yellow . . . . . **A. zonatus** sp. n.

– First funicle segment wider than second ; third clearly longer than the combined lengths of first and second ; no paired longitudinal smoky bands on thoracic dorsum ; three pairs of long setae on posterior margin of pronotum ; fore wings with nine oblique rows of short setae between speculum and the base ; three transverse rows of long dark brown setae on scutum ; two long setae on anterior face of middle coxae ; four short, stout setae on distal rim of hind tibiae ; abdominal dorsum yellowish-orange . . . . . **A. diaspidis** Howard (Silwood material)

Aphytis zonatus sp. n.

Female.

Head.—Yellowish ; width shorter than the length of antenna ; lower clypeal margin black ; subocular suture short, narrow and black ; occiput with a pair of narrow transverse black bands extending from foramen magnum to outer rim of eyes ; frontovertex broad, one and a fifth times wider than longitudinal diameter of eye ; malar space small, about three-fifths longitudinal diameter of eye ; ocelli half orange and half colourless ; vertex profusely setose with two pairs of very long dark brown setae near its posterior margin, another similar pair between anterior ocellus and respective eyes ; face reticulate, profusely setose, with setae more or less arranged in four longitudinal rows ; occiput shagreened; mandibles exserted, apex broad with two teeth and one truncation, each tooth receives a mandibular gland ; maxillary palps short, cylindrical, 2-segmented, first segment longer and wider than second ; labial palps narrow, cylindrical and 1 segmented.

Antennae (fig. 17).—Smoky, with proximal part of scape lightly smoky and apex of club very dark ; scape cylindrical, longer than pedicel and funicle united ; pedicel a little over 1·5 times longer than broad, longer than the first two funicle segments united ; third funicle segment the longest but hardly longer than combined lengths of the first two ; second segment the shortest, first least wide, third the widest ; club less than three times length of third funicle segment, shorter than the united lengths of funicle and pedicel ; two sensoria on third funicle segment and five on the club.

Thorax (fig. 18).—Dorsum yellowish with lateral margins smoky, a pair of parallel smoky longitudinal bands extending from scutal anterior margin to the propodeum ; pronotum whitish-yellow, smoky anteriorly, six pairs of long setae along posterior margin(s) ; sterna whitish-yellow with anterior margins and mid-longitudinal groove smoky ; four transverse rows of setae on scutum ; scutellum with a pair of long setae in anterolateral angles and another pair of very long setae near posterior margin ; parapsidal, scutoscutellar and transscutal sutures smoky ; mesopostphragma with truncated apex extending to second tergum.

Fore wings (fig. 19).—Extending beyond apex of abdomen ; semi-hyaline, one big dark brown patch between stigmal vein and the corresponding part of posterior margin with a tendency to become fainter in posterior part, another similar patch underneath basal part of marginal vein ; 11 oblique rows of short setae proximal to speculum ; disc profusely setose, basal end with a cluster of 10 very short setae ; two long brown setae near centre of submarginal vein ; 12 long setae along outer edge of marginal vein, 14 short setae mesal to them.

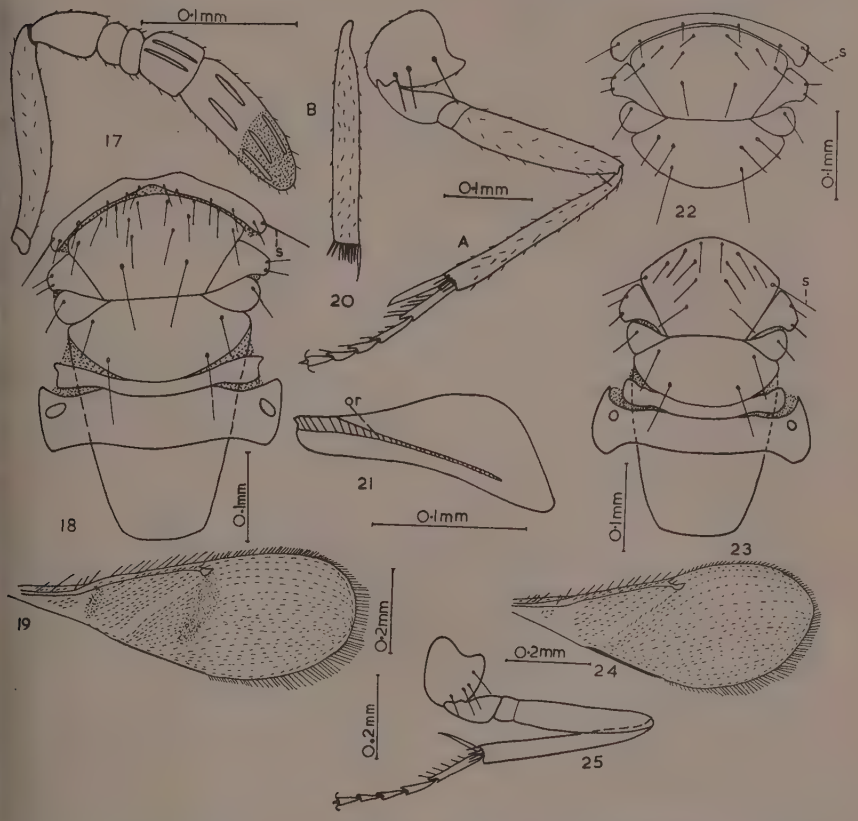
Hind wings.—Hyaline ; narrowly rounded at apex ; profusely setose ; six short hooklets at apex of marginal vein.

Fore legs.—Coxae, trochanters and femora whitish-yellow ; tibiae smoky and wide ; tarsi smoky ; coxae with three long setae on anterior face.

Middle legs (fig. 20 B).—Coxae, trochanters and femora whitish-yellow with femoral apex smoky ; tibiae and tarsi smoky ; three long setae on anterior face of coxae ; four short, stout setae on distal rim of tibiae ; tibial spur and basitarsus of the same length, remaining tarsal segments individually shorter than basitarsus.

Hind legs.—Coxae, trochanters and femora, except apex, whitish-yellow; apex of femora, entire tibiae and tarsi smoky; femora and tibiae wide; one long seta on anterior face of distal half of coxae; eight short, stout setae along distal rim of tibiae (fig. 20 A).

Abdomen.—Dorsum yellow; 1·25 times longer and slightly broader than thorax; anterior margin of second tergum smoky; outer portions of posterior margins of terga



Figs. 17–25.—*Aphytis* Howard. (17–21) *A. zonatus* sp. n. (17) Antenna. (18) Thoracic dorsum. (19) Fore wing. (20) Middle leg and hind tibia. (21) Outer plate of ovipositor. (22) *A. diaspidis* Howard (Silwood material). Pro and meso terga. (23–25) *A. variolosum* sp. n. (23) Thoracic terga, except pronotum. (24) Fore wing. (25) Middle leg. (*or*, oblique ridge; *s*, seta).

2–5, entire posterior margin of sixth tergum and anterior margin of eighth tergum smoky; outer portion of posterior margin of terga 2–6 with a cluster of about five short setae on each; setae along posterior margin of seventh tergum; distal end of abdomen broadly rounded with slightly exserted ovipositor; basal part of ovipositor lies in fifth segment; first valvifers triangular with base almost straight; third valvulae short, immovably joined to second valvifers.

Measurements of female (*in millimetres*).
Length 1·159.
Width : head 0·315.
Length : antenna 0·389, scape 0·153.
Length (*width*) *:* pedicel 0·0456 (0·0272).
Length (*width*) funicle segments : first 0·0218 (0·0242), second 0·017 (0·029), third 0·04 (0·0332).
Length (*width*) club 0·1118 (0·0342).

Material.—Holotype female reared 26.vi.53 and 2 female paratypes and 1 male allotype on different dates. Ectoparasite of *Quadraspidiotus zonatus* (Frauenfeld) on *Quercus robur* L. at Silwood Park. The holotype has been deposited in the British Museum (Nat. Hist.).

Aphytis diaspidis Howard (Silwood material).

Female.—Differs from description of *A. zonatus* sp. n. as follows :

Head.—A pair of narrow transverse bands from basal ocelli to eye rims ; frontovertex over 1·75 times longitudinal diameter of eye ; malar space a little over half the diameter of eye ; a pair of very long dark brown setae posterior to and another pair anterior to basal ocelli ; third pair of similar setae on inner rim of eyes and much anterior to the anterior ocellus.

Antennae.—First two funicle segments equal in length, third segment clearly longer than the combined lengths of the first two, second least wide ; one sensorium on third funicle segment and four on the club.

Thorax (fig. 22).—No longitudinal smoky bands on the dorsum ; three pairs of long setae along posterior margin of pronotum ; three transverse rows of long setae on scutum.

Fore wings.—Small brown patch underneath stigmal vein not extending beyond mid-longitudinal line of the disc ; nine oblique rows of short setae proximal to speculum ; basal end with a cluster of four short setae ; submarginal vein with a third seta at apex ; second row of only 12 short setae on the marginal vein.

Legs.—Forecoxae smoky with seven long setae on anterior face ; two long setae on anterior face of middle coxae, entire femora whitish-yellow ; basitarsus slightly shorter than tibial spur ; hind coxae smoky with one long seta on anterior face near distal rim ; entire femora whitish-yellow, four short, stout setae on distal rim of tibiae.

Abdomen.—Dorsum yellowish-orange with smoky transverse bands ; about 1·5 times longer than thorax ; apex narrowly rounded ; ovipositor hardly exserted with basal part lying in the middle of fourth segment.

Measurements of female (*in millimetres*).
Length 0·974.
Length (*width*) *:* pedicel 0·0454 (0·0264).
Length funicle segments : first 0·0142, second 0·0142, third 0·0368.
Length : club 0·1078, tibial spurs of middle leg 0·1, basitarsus of middle leg 0·069.

Material.—Three females reared on different dates. Ectoparasite of *Chionaspis salicis* L. on *Tilia sp.*, at Silwood Park. One specimen has been deposited in the British Museum (Nat. Hist.).

The present specimens differ from *A. diaspidis* Howard as detailed below, but the differences are probably not sufficient to justify the status of a new species.

Silwood material.	*A. diaspidis* Howard.
(1) Pedicel 1·5 times longer than broad.	Pedicel twice as long as broad.
(2) Club less than three times the length of third funicle segment.	Club three times the length of third funicle segment.
(3) A cluster of four short setae in basal area of fore wings, proximal to oblique rows.	A cluster of eight or more setae in basal area of fore wings, proximal to oblique rows.
(4) Middle tibial spur longer than basitarsus.	Middle tibial spur as long as basitarsus.

Aphytis variolosum sp. n.

Female.—Differs from description of *A. zonatus* sp. n. as follows :

Head.—Whitish-yellow ; lower clypeal margin and subocular sutures whitish-yellow ; no black transverse bands on occiput ; frontovertex as wide as longitudinal diameter of eye ; malar space a little over half width of frontovertex ; ocelli reddish ; two pairs of long dark brown setae posterior to basal ocelli, another pair on inner rim of eyes at a level slightly posterior to basal ocelli.

Antennae.—Yellow ; scape six and a quarter times longer than broad, shorter than pedicel and funicle united ; pedicel twice as long as wide ; first two funicle segments subequal in length and width ; club with narrow apex, latter not dark brown ; two sensoria on third funicle segment and two on the club.

Thorax (fig. 23).—Whitish-yellow ; dorsum reticulate ; pleura faintly reticulate ; fore wings (fig. 24) hyaline ; six oblique rows of short setae between speculum and the wing base ; submarginal vein with a third seta at the apex ; 11 long dark brown setae along outer edge of marginal vein followed by two rows of 12 and 8 short setae respectively ; basal area proximal to oblique rows with a patch of five short setae ; hind wings with three hooklets at apex of marginal vein.

Fore coxae with eight long setae on anterior face, tibiae and tarsi brown ; four long setae on anterior face of middle coxae, femora whitish-yellow, tibiae and tarsi brown ; tibial spur shorter than basitarsus (fig. 25) ; entire hind femora whitish-yellow ; four short stout setae on distal rim of tibiae.

Abdomen.—Whitish-yellow ; dorsum with anterior half almost colourless and translucent.

Measurements of female (in millimetres).
Length 0·826
Width : head 0·248.
Length : antenna 0·3732.
Length (width) : pedicel 0·0526 (0·0234).
Length (width) funicle segments : first 0·02 (0·023), second 0·02 (0·023), third 0·0454 (0·0286).

Material.—Holotype female and 1 female paratype reared 3.vii.53. Ectoparasite of *Asterolecanium variolosum* (Ratzb.) on *Quercus robur* L. at Silwood Park. The holotype has been deposited in the British Museum (Nat. Hist.).

In Mercet's (1929–30) key to the species of *Aphytis* and in Howard's (1881) description, this species runs down rather well to *A. mytilaspidis* Le Baron which is represented in the British Museum collection.

The following differences from *A. mytilaspidis* suggest that it is a new species :—

A. variolosum sp. n.	*A. mytilaspidis* Le Baron.
(1) Entire antenna yellow.	Scape and pedicel dusky.
(2) Length of antenna greater than width of head.	Length of antenna equals width of head.
(3) Scutum with four transverse rows of setae.	Scutum with three transverse rows of setae.
(4) Coxae, trochanters and femora whitish-yellow ; tibiae and tarsi brown.	Entire legs yellow.
(5) Body whitish-yellow.	Body bright lemon-yellow.

5. *Pteroptrix* Westwood.

Pteroptrix is a well-defined genus of the tribe Pteroptrichini. The uniformly broad outer plates of the ovipositor, with thickened dorsal margin (fig. 28*t*), may be suggested as a new character to separate it from *Casca* Howard.

Pteroptrix callunae sp. n.

Female.

Head.—Vertex, area of occiput above and on sides of foramen magnum and the face yellowish-orange ; hypostomal area and lower clypeal margin dark brown ; malar space yellowish-orange with a small brown patch ; interscrobal area with a broad brown band ; a narrow brown band between antennal socket and inner margin of respective eye ; mandibles broad, exserted, apex with two teeth and one truncation, each tooth with a mandibular gland ; maxillary palps 1-segmented and moderately long, labial palps 1-segmented and short.

Antennae (fig. 26).—Long ; uniformly brownish-yellow ; scape about seven times longer than broad, longer than united lengths of pedicel and funicle ; pedicel longer than first two funicle segments united ; first funicle segment subequal in length and width ; second the shortest and third the longest ; club longer than united lengths of funicle and pedicel ; first to third club segments with 3, 2, 1 sensoria respectively.

Thorax.—Pronotum, scutum except broad latero-posterior area, tegulae, axillae except base, and propodeum dark brown ; parapsides, broad latero-posterior area of scutum, entire scutellum and narrow basal part of axillae yellowish-orange ; metanotum yellowish-white ; all pleura and prosternum dark brown ; meso-and metasterna yellowish-orange ; metanotum and propodeum very narrow in the middle and expanded laterally ; mesopostphragma with truncated apex extending to middle of fourth tergum.

Fore wings (fig. 29).—Hyaline with area between margino-stigmal vein and the curved part of posterior margin dark brown ; moderately setose with only two setae in basal area ; width about 1·75 times the length of marginal fringe ; latter longest along distal part of posterior margin : eight long setae along outer edge of marginal vein followed by a row of eight very short setae ; postmarginal vein absent ; stigmal vein short, more or less parallel to the anterior margin.

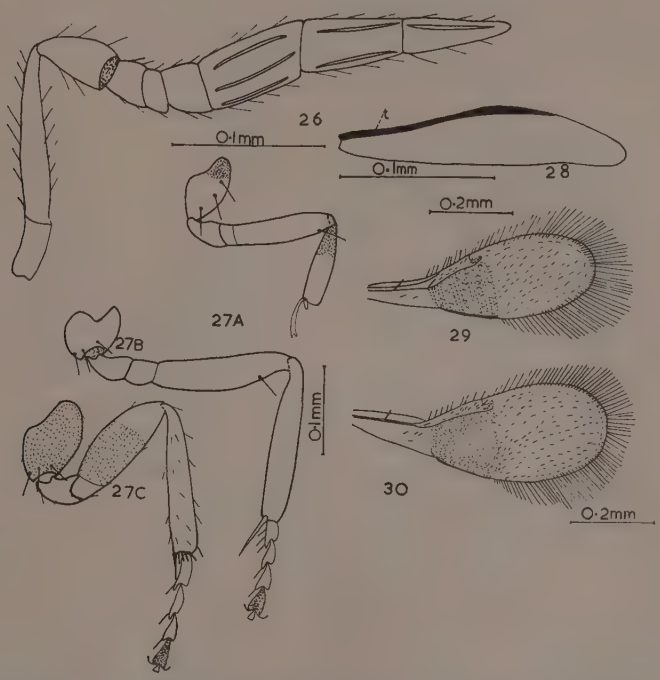
Hind wings.—Hyaline ; apex rounded ; sparingly setose ; two hooklets at the apex of marginal vein.

Fore legs (fig. 27 A).—Entire leg, except proximal end of coxae, basal half of tibiae and fourth tarsal segment, whitish-yellow ; proximal end of coxae dark brown ; basal half of tibiae and fourth tarsal segment brown ; three long setae on anterior face of coxae ; one short, stout peg near base of spur.

Middle legs (fig. 27 B).—Entire leg whitish-yellow except fourth tarsal segment which is brown ; three long setae along distal rim of coxae ; basitarsus shortest among tarsal segments.

Hind legs (fig. 27 C).—Reticulate ; setose ; coxae, femora except trochantellus and apical third, and fourth tarsal segments dark brown ; remaining part of legs whitish-yellow ; three long setae along distal rim of coxae ; four short, stout setae on distal rim of tibiae.

Abdomen.—Reticulate ; dark brown ; distal end narrowly rounded ; ovipositor concealed with base lying in the fifth segment ; first valvifers distinctly triangular ; second valvifers with submarginal ridge along dorsal margin ; third valvulae short and immovably joined with second valvifers.



FIGS. 26–30.—*Pteroptrix* Westwood. (26–29) *P. callunae* sp. n. (26) Antenna. (27) Incomplete fore, and entire middle and hind legs. (28) Outer plate of ovipositor. (29) Forewing. (30) *P. zonatus* sp. n. Fore wing. (*t*, thickened dorsal margin).

Male : Resembles the female except in the following characters :

No brownish patch on malar space ; upper part of occiput with a narrow yellowish line connecting vertex with dorsal margin of foramen magnum ; pedicel a little wider than long ; first and third funicle segments longer than broad with four and two sensoria respectively ; second funicle segment moniliform ; two sensoria on each club segment ; fore coxae dark brown, femora except the base, and tibiae brown ; middle coxae dark brown, femora except trochantellus and apex, and the tibiae brown ; hind legs dark brown except tarsi which are brown.

Measurements of female (in millimetres).

Length 0·755.

Length (width) : scape 0·142 (0·02).

Length (width) funicle segments : first 0·0274 (0·0274), second 0·0152 (0·026), third 0·031 (0·035).

Length (width) : pedicel (*male*) 0·051 (0·057).

Material.—Holotype female reared 19.vi.53. Two female paratypes, 1 male allotype and 1 male paratype bred on different dates. Endoparasite of *Diaspidiotus bavaricus* (Lindinger) on *Calluna vulgaris* (L.) Hull at Silwood Park. The holotype has been deposited in the British Museum (Nat. Hist.). This species resembles *P. dimidiatus* Westwood, which is represented in the British Museum, but the following differences have been noted.

	P. callunae sp. n.	*P. dimidiatus* Westwood.
(1)	First funicle segment as long as wide.	Width greater than length.
(2)	Fore coxae, except articular area, trochanters, femora, apical half of tibiae and first three tarsal segments whitish-yellow; articular area of coxae dark brown; basal half of tibiae brown.	Fore legs dark brown with knee whitish.
(3)	Entire middle legs whitish-yellow except fourth tarsal segment, which is dark brown.	Entire middle legs dark brown except tibial apex and first three tarsal segments which are dirty-white.
(4)	Hind coxae, basal half of femora and fourth tarsal segment dark brown; remaining parts whitish-yellow.	Entire hind legs dark brown except trochantellus, basal fourth of tibiae and tarsal segments 1–3, which are dirty-white.

Pteroptrix zonatus sp. n.

Female.—Differs from description of *P. callunae* sp. n. as follows:

Head.—Vertex, face, lower part of occiput and malar space yellow; a pair of small dark brown patches on lower part of occiput; hypostomal area and upper part of occiput dark brown; narrow yellowish band from vertex to foramen magnum; antennae uniformly brown; scape about six times longer than wide; first funicle segment longer than wide; third segment almost as long as wide.

Thorax.—Reticulate except parapsides and metanotum which are shagreened; parapsides, latero-posterior submarginal area of scutum, basal part of axillae, scutellum and metanotum yellowish; sterna dark brown; marginal vein of fore wings (fig. 30) with nine long setae along outer edge which are followed by ten short setae; stigmal vein curved with apex directed towards anterior margin; width of fore wing about two and a third times the length of marginal fringe; entire fore and middle legs yellowish with fourth tarsal segment dark brown; two long setae on anterior face of fore coxae; trochanters, trochantellus and apical third of femora, entire tibiae and tarsal segments 1–3 of hind legs yellowish, hind coxae with two long setae on distal rim, five short, stout setae on distal rim of tibiae.

Measurements of female (in millimetres).
Length 0·84.
Length (width): scape 0·18 (0·036).
Length (width) funicle segments: first 0·031 (0·0304), second 0·0154 (0·0298), third 0·0328 (0·0322).

Material.—Holotype female reared 18.vi.53. Endoparasite of *Quadraspidiotus zonatus* (Frauenfeld) on *Quercus robur* L. at Silwood Park. The holotype has been deposited in the British Museum (Nat. Hist.)

6. *Azotus* Howard.

The genus *Azotus* is one of the easily recognizable genera of the Aphelinidae. The following three new generic characters have been discovered: (1) Pronotum

(fig. 31) with deeply concave anterior and posterior margins and with a submarginal ridge along each lateral margin (*plr*); (2) outer plates of ovipositor uniformly narrow with thin dorsal margin (fig. 35B.); (3) first valvifers semicircular in shape (fig. 35A.).

This genus has not previously been recorded from Great Britain but a slide of an insect identified as *A. pinifoliae* Mercet is in the Hope Department at Oxford.

Azotus brittanicus sp. n.

Female.

Head.—Faintly reticulate; vertex, face, malar space, hypostoma and lower clypeal margin yellowish-orange; occiput very dark brown; a moderately broad dark brown band, starting from occiput near laterodorsal angle of eye and descending along outer and lower parts of eye rim, crosses the face well above the antennal socket to join the band on the other side; frontovertex moderately broad, being as wide as length of malar space; eyes red with longitudinal diameter 1·25 times greater than width of frontovertex, ocular rim whitish with bluish reflections; ocelli half red and half yellowish-orange, basal ocelli very close to occiput margin, each removed from respective eye by the length of the base of ocellar triangle; three brown spots on vertex (two of them slightly latero-posterior to basal ocelli and the third anterior to the anterior ocellus); mandibles small, reddish-brown, apex with two teeth and one truncation, two mandibular glands opening on the teeth; outer surface of maxillo-labial complex dark brown, maxillary palps 2-segmented with longer apical segment; labial palps 1-segmented.

Antennae (fig. 32).—Inserted midway between lower clypeal margin and the lower rim of eyes; scape, basal two-thirds of pedicel, first and third segments of funicle and basal three-fourths of club dark brown; apical third of pedicel, second and fourth funicle segments white; apical fourth of club yellowish-brown; scape as long as club; pedicel shorter than first funicle segment; first segment the longest, third the shortest, second and fourth of the same length; club longer than combined lengths of the preceding three segments and possessing 4 sensoria.

Thorax.—Scutum, scutellum bluish; axillae, parapsides, metanotum and propodeum very dark brown; tegulae whitish with a brown patch at apex; pleura and sterna dark brown; scutellum closely transversely striated; propodeum broad, sparsely transversely striated; pronotum, parapsides, axillae reticulate; metanotum narrow and smooth; a pair of long setae in each dorsoposterior angle of pronotum (fig. 31 *s*); mesopostphragma dark brown with truncated apex extending to third abdominal tergum.

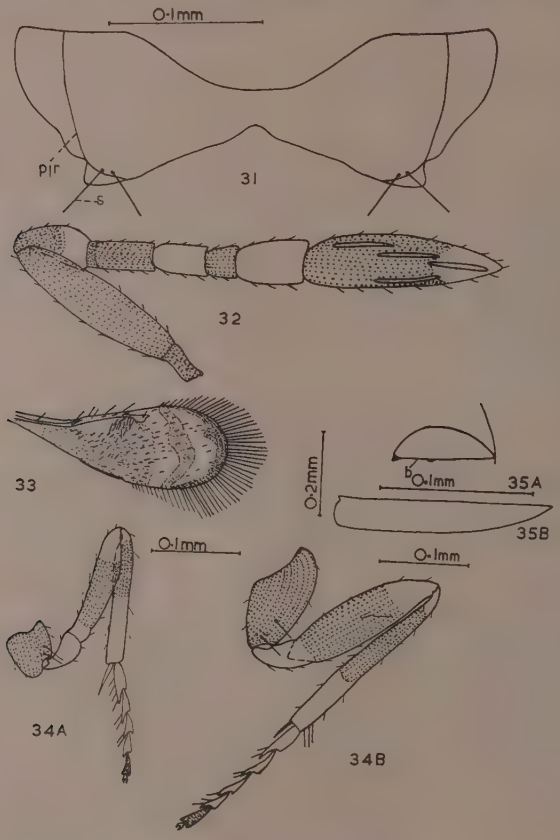
Fore wings (fig. 33).—Submarginal vein thin, about 1·25 times longer than marginal vein with a short dark brown seta in basal and another in apical half; marginal vein thick, with four long setae on outer edge and four short setae slightly mesal to them; postmarginal vein shorter than stigmal vein; entire basal two-thirds of wings very dark brown except an oblique semi-hyaline patch underneath marginal vein; apical third semi-hyaline with a broad transverse brown band; another brown band present just before the apex, the ends of which meet the respective ends of the first band; basal quarter of wings devoid of setae, middle third moderately setose, apical third sparingly setose, a group of 12 moderately long, thick dark brown setae underneath apical end of marginal vein; marginal fringe equals half width of wing.

Hind wings.—Non-pedunculate; semi-hyaline; two hooklets at apex of marginal vein; marginal fringe very long.

Legs (fig. 34 A and B).—Coxae, fifth tarsal segment dark brown; trochanters, trochantellus, apex of fore femora, apical fourth of middle and hind femora and tarsal segments 1–4 yellowish, remaining parts of femora dark brown; fore tibia dark brown with basal tip and apical third yellowish; middle and hind tibiae yellowish with a big dark brown patch on basal half; two very long setae on anterior face of distal half of middle

and hind coxae ; three long, stout setae near dorsal angle of distal rim of hind tibiae ; middle tibial spur shorter than basitarsus.

Abdomen.—Very dark brown ; dorsum reticulate on sides and smooth in the middle with scattered setae ; apex narrowly rounded ; ovipositor greatly exserted with exserted part about one-third the length of abdomen, dark brown with yellowish apex ; base of



Figs. 31–35.—*Azotus brittanicus* sp. n. (31) Pronotum. (32) Antenna. (33) Fore wing. (34) Middle and hind legs. (35) First valvifer and outer plate of ovipositor. (*b*, base of first valvifer ; *plr*, lateral ridge ; *s*, seta).

ovipositor lies in the second segment ; subgenital plate with straight posterior margin concealing basal two-thirds of ovipositor ; third valvulae immovably joined with the second valvifers.

Male : Resembles the female except in the following characteristics :

Vertex, face, malar space yellowish ; antennae uniformly yellowish-brown ; club indistinctly 2-segmented, shorter than the three preceding segments together ; three sensoria on each of the first and second funicle segments, two on fourth and three on each club segment.

Measurements of female (in millimetres).

Length : 0·882, abdomen 0·355, exserted part of ovipositor 0·145, marginal fringe of fore wing 0·1.

Maximum width of fore wing 0·2.

Length (width) funicle segments : first 0·0474 (0·02), second 0·04 (0·02), third 0·0286 (0·02), fourth 0·04 (0·025).

Length (width) : club 0·12 (0·034).

Material.—Holotype female reared, 18.vi.53. Four female paratypes, 1 male allotype, and 9 male paratypes bred on different dates. Endoparasite of *Quadraspidiotus zonatus* (Frauenfeld) on *Quercus robur* L. at Silwood Park. The holotype and a few paratypes have been deposited in the British Museum (Nat. Hist.).

A. brittanicus does not run well in Mercet's (1929–30) key to species of the genus *Azotus*. However it can tentatively be placed as a new species close to *A. pinifoliae* Mercet, from which it differs as follows :—

	A. brittanicus sp. n.	*A. pinifolia* Mercet.
(1)	Head yellowish-orange with occiput very dark brown ; a dark brown band starting from latero-dorsal angle of one eye crosses the face to end on latero-dorsal angle of the other eye ; ocular rim white with bluish reflections.	Head yellowish-grey with a white band along inner rim of eyes.
(2)	Ocelli half red and half yellowish-orange.	Ocelli reddish-orange.
(3)	Basal two-thirds of pedicel dark brown, apical third white.	Pedicel entirely white.
(4)	Club dark brown with apical fourth yellowish-brown.	Club blackish.
(5)	Length of marginal fringe equals half the width of fore wing.	Length of marginal fringe greater than half the width of fore wing.
(6)	Legs dark brown and yellowish in parts ; trochantellus, apex of fore femora, apical fourth of middle and hind femora yellowish, remaining parts of femora dark brown ; fore tibiae dark brown with basal tip and apical third yellowish ; middle and hind tibiae yellowish with a big dark brown patch on basal half.	Legs whitish ; femora dark in apical third ; tibiae brown at the base.
(7)	Ovipositor long, exserted part about one-third the length of abdomen.	Ovipositor short.
(8)	Size 0·882 mm.	Size 0·6–0·7 mm.

7. *Casca* Howard.

One of the important generic characters, namely the first two tarsal segments of the middle leg being together as long as the tibial spur, is not present in the following new species, *Casca brittanica* sp. n. In addition, the fact that these first two tarsal segments are equal in length and the third slightly shorter than either suggests the erection of a new genus for this species. Nevertheless, for the present, it is included in the genus *Casca*. The outer plates of the ovipositor

not being uniformly broad and possessing a broad marginal inflection along the dorsal margin (fig. 40 ; *mi*) is suggested as a new generic character for its separation from the genus *Pteroptrix* Westwood.

The genus *Casca* has not previously been recorded from Great Britain, but a slide of an insect identified as *Casca* sp. is in the Hope Department at Oxford.

Casca brittanica sp. n.

Female.

Head.—Vertex, face, ocular rim yellowish-orange with a dark brown patch on ocellar triangle ; occiput, hypostomal area, malar space, interscrobal area dark brown ; a small dark brown patch between antennal socket and respective eye rim ; subocular suture distinct ; occiput and vertex reticulate with vertex quite profusely setose ; upper part of the face transversely striated ; lower part of the face, malar space shagreened ; eyes reddish-brown with longitudinal diameter slightly shorter than width of frontovertex ; malar space a little shorter than two-thirds width of frontovertex ; ocelli partly reddish-brown and partly yellowish-orange, basal ocelli well removed from eyes and from occipital margin ; mandibles brownish-orange with one tooth and one truncation ; maxillary and labial palps each 1-segmented.

Antennae (fig. 36).—Scape, basal third of pedicel, third club segment brown ; apical two-thirds of pedicel, entire funicle, first two club segments yellowish ; scape longer than combined lengths of pedicel and funicle ; pedicel longer than first funicle segment; the latter clearly longer but as wide as the second segment ; club 3-segmented with 2, 3, 2 sensoria respectively

Thorax (fig. 37).—Pronotum, tegulae, pleura and prosterna dark brown ; narrow, transverse whitish-yellow submarginal line along anterior margin of mesopleura ; scutum dark brown except narrow lateral areas and a small posterior marginal area which are yellowish-orange ; parapsides yellowish-orange with a dark brown patch in anterior region ; axillae dark brown with a small basal area silvery with bluish reflections ; scutellum, metanotum and propodeum silvery with bluish reflections, a dark brown patch on each side of propodeum ; meso- and metasterna whitish-yellow ; pronotum, scutum, axillae and pleura reticulate ; parapsides and scutellum smooth ; metanotum and propodeum transversely striate ; anterior pronotal margin deeply concave in middle, four pairs of long setae along the straight posterior margin(s) ; metanotum like a concave narrow band expanded laterally ; mesopostphragma dark brown with truncated apex extending to fourth abdominal tergum.

Fore wings (fig. 38).—Hyaline with area between marginal vein and curved part of posterior margin dark brown ; submarginal vein hardly longer than marginal vein ; stigmal vein short with narrow apex directed towards anterior margin ; postmarginal vein shorter than stigmal vein ; one long seta on basal and another short one on apical half of submarginal vein, a third seta at the junction of submarginal and marginal veins ; five long setae along outer margin of marginal vein and six short setae mesal to them ; curved part of posterior margin maintains uninterrupted continuity with the distal part of posterior margin ; basal area devoid of setae, disc moderately setose with a small oval non-setose area beyond stigmal vein ; marginal fringe as long as half the width of the disc.

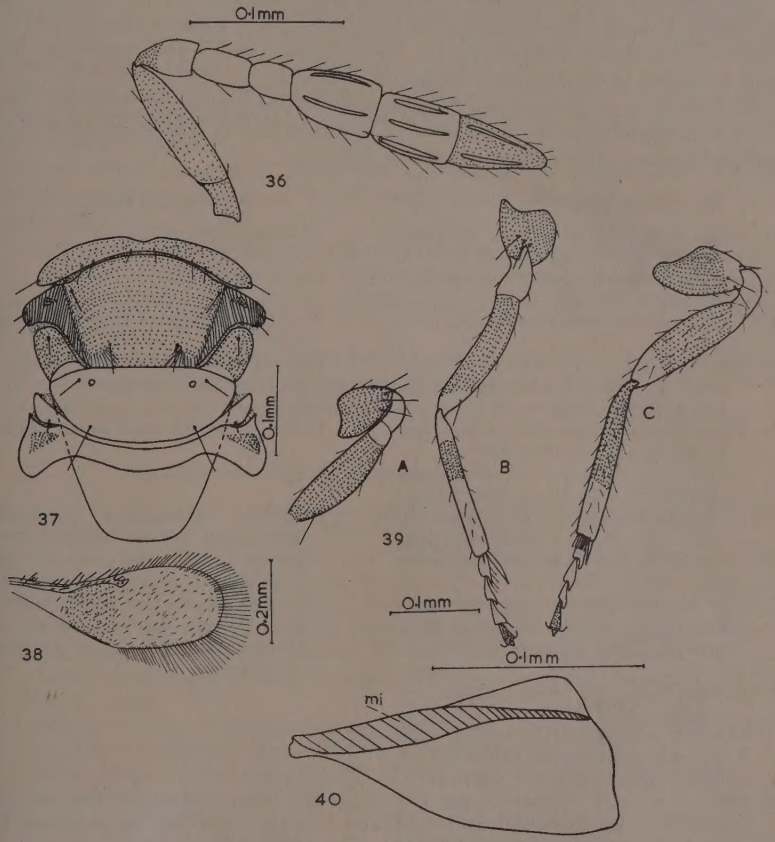
Hind wings.—Non-pedunculate ; hyaline with a small brown patch near marginal vein ; three hooklets at apex of marginal vein.

Fore legs.—Coxae, femora except trochantellus, tibiae and fourth tarsal segment dark brown ; trochanter and trochantellus dirty-white ; tarsal segments 1–3 yellowish ; four very long setae along distal rim of coxae (fig. 39 A).

Middle legs (fig. 39 B).—Coxae, femora except apex, and fourth tarsal segment dark brown ; trochanters, apex of femora and entire tibiae dirty-white with a large dark brown patch on basal half of tibiae ; tarsal segments 1–3 yellowish ; spur longer than

basitarsus but clearly shorter than united lengths of basitarsus and second tarsal segment; basitarsus as long as second tarsal segment, third segment shorter than either of the first two segments; fourth the shortest; entire tarsus clearly shorter than the hind tarsus; three very long setae on anterior face of distal half of coxae; one short, stout seta near base of spur.

Hind legs (fig. 39 c).—Coxae except apical end, basal two-thirds of tibiae and fourth tarsal segment dark brown; femora dark brown except trochantellus and apical fourth



Figs. 36–40.—*Casca brittanica* sp. n. (36) Antenna. (37) Thoracic terga. (38) Fore wing. (39) Incomplete fore and entire middle and hind legs. (40) Outer plate of ovipositor. (*mi*, marginal inflection of outer plate).

which are dirty-white; coxal apex, trochanters and apical third of tibiae dirty-white; tarsal segments 1–3 yellowish; one very long seta on anterior face of distal half of coxae and two similar setae along distal rim; seven short, stout setae on distal rim of tibiae.

Abdomen.—Dark brown; distal end narrowly rounded; dorsum distinctly reticulate on sides and faintly so in the middle; ovipositor slightly exserted with base lying in fifth segment; first valvifers triangular with base slightly curved; third valvulae immovably joined with the second valvifers.

Measurements of female (in millimetres).

Length : 0·719, tibial spur of middle leg 0·0542, basitarsus of middle leg 0·04, second tarsal segment of middle leg 0·04, third tarsal segment of middle leg 0·0358.

Length (*width*) pedicel 0·047 (0·03); funicle segments : first 0·0452 (0·026), second 0·0312 (0·026).

Length (*width*) club 0·1868 (0·04).

Material.—Holotype female reared on 24.vi.53 and 12 female paratypes on different dates. Endoparasite of *Quadraspidiotus zonatus* (Frauenfeld) on *Quercus robur* L. at Silwood Park. The holotype and a few paratypes have been deposited in the British Museum (Nat. Hist.).

C. brittanica sp. n. runs well in Compere's (1936) key to species of the genus *Casca* and comes close to *C. chinensis* Howard, which is not represented in the British Museum. The differences are as follows :—

	C. brittanica sp. n.	*C. chinensis* Howard.
(1)	Scape, basal third of pedicel, third club segment brown ; apical two-thirds of pedicel, funicle, first two club segments yellowish.	Antennae light yellow.
(2)	First funicle segment shorter than pedicel.	First funicle segment longer than pedicel.
(3)	Narrow lateral and a little of posterior areas of scutum yellowish-orange, rest of scutum dark brown.	Scutum blackish with latero-posterior area light lemon yellow.
(4)	Parapsides yellowish-orange with a dark brown patch in anterior half.	Entire parapsides light lemon yellow.
(5)	Axillae dark brown with small basal area silvery with bluish reflections.	Entire axillae blackish.
(6)	Scutellum, metanotum, propodeum silvery with bluish reflections ; dark brown patch on sides of propodeum.	Scutellum, metanotum, propodeum light lemon yellow with iridescent pearly lustre ; no patch on propodeum.
(7)	Fore legs dark brown except trochanters and trochantellus, which are dirty yellow ; tarsal segments 1–3 yellowish.	Fore and middle legs faintly suffused with fuscous, less extensively distributed than the fuscous markings of hind legs.
(8)	Middle legs dark brown except trochanters, apex of femora and tibiae which are dirty-white with a dark brown patch on basal half of tibiae ; tarsal segments 1–3 yellowish.	
(9)	Hind legs dark brown except trochanters, trochantellus, apices of coxae and femora and apical third of tibiae which are dirty-white ; tarsal segments 1–3 yellowish.	Hind legs dominantly fuscous ; the knees, basal half of the tibiae and tarsi pallid.

III. Acknowledgments.

I am greatly indebted to Prof. O. W. Richards for his valuable guidance during my work and for taking great pains in going through the manuscript. I am also grateful to Dr. K. Boratynski for his interest in my problem and for identifying the scale insects, and to Prof. G. C. Varley for permission to consult the Chalcid Collections in his Department at Oxford. Sincere thanks are also

due to Mr. G. J. Kerrich for providing access to the Chalcid Collection of the British Museum (Natural History) and for many useful suggestions.

IV. Summary.

The division of the genus *Aspidiotiphagus* Howard into two subgenera, namely *Aspidiotiphagus* Howard subgen. n., *Paraspidiotiphagus* subgen. n., is proposed. This division is based on the relationship of the length of the hairs of the marginal fringe and the width of the forewing and shows a probable link between *Aspidiotiphagus* and *Prospaltella* Howard.

The division of the genus *Aphytis* Howard into the two subgenera, *Aphytis* Howard and *Prosaphelinus* De Gregoria, is not accepted because the differences seem to be unreliable.

Casca brittanica sp. n. is doubtfully retained in the genus *Casca* Howard with the suggestion, based on fairly strong characters, that a new genus be erected for it.

The pronotum, outer plates of the ovipositor and first valvifers are shown to be new generic characters. These, in combination with other characters, have been used to prepare a key for the identification of the British genera of Aphelinidae referred to in this paper.

Some setal characters have been found to be reliable new specific characters, and these work well in genera where more than one species is recorded.

Azotus Howard and *Casca* Howard are genera new to Great Britain.

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